

WHAT IS CLAIMED IS:

1. An aqueous composition for chemical mechanical planarization of a wafer or film using a fixed polishing pad, the composition comprising:
 - (a) from about 0.2 to about 10 weight % of abrasive nanoparticles having an average particle size of between about 10 and about 200 nanometers; and
 - (b) from about 90 to about 99.8 weight % of water;wherein the pH of the composition is between about 3 and about 5 or between about 9 and about 12, and the composition does not comprise polyelectrolytes.
2. A composition according to claim 1 wherein the number of particles with a diameter greater than about 100 nanometers is less than about 1 weight %.
3. A composition according to claim 1 wherein the nanoparticles are ceria.
4. A composition according to claim 3 wherein the fixed polishing pad is a fixed abrasive pad.
5. A composition according to claim 4 wherein the pH of the composition is between about 9 and about 12.
6. A composition according to claim 5 wherein the amount of ceria nanoparticles is from about 0.2 to about 3 weight %.
7. A composition according to claim 1 wherein the nanoparticles are silica.

8. A composition according to claim 7 wherein the pH of the composition is between about 9 and about 11.
9. A composition according to claim 8 wherein the amount of silica nanoparticles is from about 1 to about 5 weight %.
10. A composition according to claim 1 wherein the nanoparticles are ceria and silica in a ratio of between about 10: 1 and about 1:10 ceria:silica.
11. A composition according to claim 2 further comprising from about 0.3 to about 3 weight % of a substantially water-soluble surfactant.
12. A composition according to claim 11 wherein the wafer is a fixed pattern wafer.
13. A composition according to claim 9 further comprising from about 0.3 to about 3 weight % of a substantially water-soluble anionic or nonionic surfactant.
14. A process according to claim 2 which does not comprise an amino acids additive.
15. A composition according to claim 2 wherein the particle size range of the nanoparticles is between about 10 and about 100 nanometers.
16. A composition according to claim 4 wherein the particle size range of the nanoparticles is between about 15 and about 50 nanometers.
17. A composition according to claim 16, which does not comprise any other ingredients.

18. A composition according to claim 1, wherein a substantial majority of the nanoparticles are silica nanoparticles coated with a plurality of smaller ceria nanoparticles, the average particle size of the ceria nanoparticles being less than about half the average particle size of the silica nanoparticles.

19. A composition according to claim 10, wherein the nanoparticles are silica nanoparticles having an average particle size of between about 10 and about 50 nanometers, a substantial number of the silica nanoparticles being substantially coated with ceria nanoparticles, the ceria nanoparticles having an average particle size between about 1 and about 5 nanometers.

20. A composition according to claim 1 wherein the nanoparticles are alumina.

21. A composition according to claim 20 wherein the film is a blanket film.

22. A composition according to claim 1 wherein the nanoparticles are polymers.

23. A composition according to claim 22 wherein the polishing pad is a fixed abrasive pad with cylindrical, pyramidal, hexagonal, square, or rectangular structures.

24. A composition according to claim 1 wherein the nanoparticles are zirconia.

25. A composition according to claim 2 wherein the nanoparticles are hematite.

26. A composition according to claim 1 wherein the nanoparticles are magnesia.

27. A composition according to claim 2 wherein the nanoparticles are titania or yttria.

28. A composition according to claim 15 wherein the nanoparticles are tin oxide.

29. An aqueous composition for chemical mechanical planarization of a shallow trench isolation film using a fixed abrasive pad, the composition comprising:

(a) from about 0.2 to about 10 weight % of abrasive nanoparticles having an average particle size of between about 10 and about 100 nanometers; and

(b) from about 90 to about 99.8 weight % of water;
wherein the pH of the composition is between about 9 and 12, and the composition does not comprise polyelectrolytes.

30. A one-step process for chemical mechanical planarization of a wafer, regardless of wafer topography, using a fixed polishing pad, the process comprising the steps of:

a) mechanically polishing the wafer with the pad; and
b) feeding an aqueous composition comprised of abrasive nanoparticles to the pad during planarization, the composition having a pH of between about 3 and about 5 or between about 9 and about 12.

31. A process according to claim 30 without an additional step of adding a polyelectrolyte solution to the pad.

32. A composition according to claim 30 wherein no other slurry is added to the pad during polishing.

33. A process according to claim 30 consisting essentially of steps a) and b).